WHAT IS CLAIMED IS:

1	1. A method for measuring blood oxygen saturation, comprising the steps			
2	of:			
3	providing a sensor and a pulse oximeter;			
4	selecting a light source and a light detector;			
5	optimizing a wavelength spectrum of light received by said light detector from			
6	said light source for an oxygen saturation reading less than 80 percent;			
7	placing said sensor on a patient; and			
8	determining said blood oxygen saturation using said sensor and said pulse			
9	oximeter.			
1	2. The method of claim 1, wherein said optimizing step is for an oxygen			
2	saturation of a fetus.			
1	3. The method of claim 2, including optimizing said wavelength spectrum			
2	for an oxygen saturation reading less than 65 percent.			
1	4. The method of claim 2, including optimizing said wavelength spectrum			
2	for an oxygen saturation reading greater than 15%.			
1	5. The method of claim 2 further comprising the step of:			
2	placing a detector on said sensor;			
3	optimizing a spacing of said light source from said detector to reduce the			
4	sensitivity of said sensor to perturbation induced artifact; and			
5	measuring the intensity of light from said light source at said detector using			
6	light scattered through said fetus.			
1	6. The method of claim 4 wherein a spacing between where said light is			
2	injected into said tissue and collected from said tissue is at least 10 mm.			
1	7. The method of claim 1 wherein said received light comprises a red			
2	spectrum and an infrared spectrum, each of said red and infrared spectrums having an			
3	extinction and a scattering coefficient associated with blood perfused tissue, said optimizing			
4	step comprising choosing wavelength spectrums within said red and infrared spectrums			
5	whose product of their respective extinction and scattering coefficients form first and second			

6 values, a ratio between said first and second values being between 0.5 and 2 for a majority of 7 the oxygen saturation reading range of 0 to 65 percent. 1 The method of claim 2 wherein said received light comprises a red 2 spectrum and an infrared spectrum, said optimizing step comprising using a first spectrum 3 within said infrared spectrum in a range useful for a patient having high saturation, and 4 optimizing the red spectrum to a second spectrum for a fetus. 1 9. The method of claim 8 wherein the mean wavelength of said second 2 spectrum is between 700 and 790 nanometers. 1 10. The method of claim 8 wherein said second spectrum includes 735 nanometers at an intensity of at least 50% of the intensity of any other wavelengths in said 2 3 second spectrum. 1 11. The method of claim 2 wherein said optimizing step increases a depth 2 of penetration of said light in a fetus compared to an optimum penetration depth for a patient 3 having high saturation. 1 12. The method of claim 1 wherein said optimizing step reduces the sensitivity of said determining step to artifact. 2 1 13. The method of claim 1 wherein said optimizing step includes selecting 2 said light source to have a desired wavelength spectrum. 1 14. The method of claim 1 wherein said optimizing step includes selecting 2 said light detector which detects a limited spectrum of light. 1 15. The method of claim 1 wherein said optimizing step includes filtering 2 said light source to pass a desired wavelength spectrum. 1 16. The method of claim 1 further comprising the step of alternately 2 optimizing said wavelength spectrum of light received by said light detector from said light 3 source for an oxygen saturation reading greater than 80 percent. 1 17. A method for measuring blood oxygen saturation in a fetus, 2

4

providing a sensor and a pulse oximeter;

comprising the steps of:

3

4	selecting a light source and a light detector;			
5	detecting light at said detector comprising red and infrared spectrums;			
6	selecting the infrared spectrum so as to have a wavelength spectrum useful for			
7	measuring oxygen saturation in a patient with high saturation;			
8	optimizing a wavelength spectrum of said red spectrum to a mean wavelength			
9	between 700 and 790 nanometers for an oxygen saturation reading between 15 and 65			
10	percent, said optimizing increasing an immunity of a measurement of blood oxygen			
11	saturation to perturbation artifact;			
12	placing said sensor on said fetus;			
13	measuring an intensity of at least two light signals from said light source at			
14	said light detector after being scattered through a portion of said fetus; and			
15	determining said blood oxygen saturation using said intensity and said pulse			
16	oximeter.			
1	18. The method of claim 17 further comprising the step of measuring a			
2				
3	third light signal from detected light scattered through a portion of said fetus, the third light signal having a mean wavelength less than 700 nanometers and being optimized for an			
4	oxygen saturation reading greater than 65% percent.			
7	oxygen saturation reading greater than 0370 percent.			
1	19. A method for using a pulse oximeter to measure blood oxygen			
2	saturation in a patient, comprising the steps of:			
3	selecting a light source and a light detector for a sensor;			
4	detecting light at said detector comprising first and second light spectrums,			
5	each of the light spectrums having an extinction and a scattering coefficient associated with			
6	blood perfused tissue;			
7	optimizing said light spectrums by choosing wavelength spectrums whose			
8	product of their respective extinction and scattering coefficients form first and second value			
9	a ratio between said first and second values being between 0.5 and 2 for a majority of the			
10	oxygen saturation reading range of 0 to 65 percent;			
11	placing said sensor on said patient; and			
12	determining said blood oxygen saturation using said sensor and said pulse			
13	oximeter.			

1	20. The method of claim 19 further comprising the step of alternately		
2	optimizing said light spectrum for an oxygen saturation reading range greater than 65%		
3	percent.		
1	21. A method for measuring blood oxygen saturation in a fetus,		
2	comprising the steps of:		
3	providing a sensor and a pulse oximeter;		
4	selecting a far red and infrared light source and a light detector;		
5	detecting light at said detector including an infrared wavelength spectrum		
6	useful for measuring oxygen saturation in a patient with high saturation, the detected light		
7	including a far red wavelength spectrum which has a mean wavelength between 700 and 790		
8	nanometers;		
9	placing said light sources in a single encapsulated package and mounting said		
10	package on said sensor;		
11	placing said sensor on said fetus;		
12	measuring an intensity of light from said light source at said light detector		
13	after scattering through a portion of said fetus; and		
14	determining said blood oxygen saturation using said intensity and said pulse		
15	oximeter.		
1	22. The method of claim 21 further comprising the steps of:		
2	selecting a second red light source;		
3	selecting a wavelength spectrum of said second red light source to have a		
4	mean wavelength less than 700 nanometers; and		
5	selectively activating either or both said first mentioned or second red light		
6	source.		
1	23. A fetal pulse oximeter sensor comprising:		
2	a housing;		
3	at least one light source mounted in said housing;		
4	at least one detector mounted in said housing;		
5	means for detecting light subsequent to being scattered by fetal tissue, the light		
6	including an infrared light spectrum, said infrared spectrum having a range useful for		
7	measuring oxygen saturation in a patient with high saturation, the detected light also		

8	including a red light spectrum, said red light spectrum having a mean wavelength between		
9	700 and 790 nanometers; and		
10	said detector being mounted in said housing spaced from said light sources		
11	and positione	d to det	ect light from said light sources.
1 2	LED.	24.	The sensor of claim 23 wherein said light source comprises at least one
í 2	infrared light	25. sources	The sensor of claim 23 wherein said light source comprises red and spaced from said detector by at least 10 mm.
1 2	infrared light	26. sources	The sensor of claim 23 wherein said light source comprises red and spaced from said detector by at least 14 mm.
1 2	light source w	27. ⁄hich en	The sensor of claim 23 wherein said means for providing comprises a nits a limited spectrum.
1 2	filter between	28. said lig	The sensor of claim 23 wherein said means for providing comprises a ght source and said detector for passing a limited spectrum of light.
1 2	wavelength se	29. ensitive	The sensor of claim 23 wherein said means for providing comprises a detector which detects a limited spectrum of light.
1 2 3	700 nanomete		The sensor of claim 23 further comprising: s for providing a red light spectrum having a mean wavelength less than
1 2 3 4	between 700 :	and 790	The sensor of claim 30 wherein neans for providing a red light spectrum having a mean wavelength nanometers is a first light emitting diode; and neans for providing a red light spectrum having a mean wavelength less
5	than 700 nanometers is a second light emitting diode.		
1 2	comprising:	32.	A sensor for a pulse oximeter for measuring blood oxygen saturation,
3		_	source;
4		a light	detector;

5	one of said light source and light detector including means for providing light		
6	comprising first and second spectrums, each of the spectrums being optimized for the		
7	products of their respective extinction and scattering coefficients in blood perfused tissue, the		
8	products forming first and second values, a ratio between said first and second values being		
9	between 0.5 and 2 for a majority of the oxygen saturations less than 80 percent.		
1	33. The sensor of claim 32 wherein said light source and said detector are		
2	spaced apart by at least 14 mm.		
1	34. The sensor of claim 32 further comprising means for providing a red		
2	spectrum having a mean wavelength less than 700 nanometers.		
1	35. A sensor for a pulse oximeter for measuring blood oxygen saturation in		
2	a fetus, comprising:		
3	a radiation source;		
4	a radiation detector;		
5	at least one of said source and detector being optimized for reducing the		
6	sensitivity of a blood oxygen saturation measurement to perturbation induced artifact for		
7	saturations less than 65 percent.		
1	36. The sensor of claim 35 wherein said radiation source comprises red		
2	and infrared LEDs spaced from said detector by at least 10 mm.		
_	and infrared EED's spaced from said detector by at least 10 film.		
1	37. The sensor of claim 35 wherein said radiation source comprises red		
2	and infrared LEDs spaced from said detector by at least 14 mm.		
1	38. The sensor of claim 35 further comprising means for alternately		
2	optimizing said source and detector for oxygen saturation readings greater than 65%.		
1	39. The sensor of claim 38 further comprising a second red light source		
2	having a mean wavelength less than 700 nanometers.		
1	40. A sensor for measuring blood oxygen saturation in a fetus, comprising:		
2	an infrared light source having a wavelength spectrum useful for measuring		
3	oxygen saturation in a patient with high saturation;		
4	a deep red light source having a mean wavelength between 700 and 790		
5	nanometers; and		

6	a single encapsulated package enclosing said red and infrared light sources,		
7	said package being mounted on said sensor.		
1	41. A method of using a pulse oximeter, comprising the steps of:		
2	receiving at least first and second signals from a sensor obtained by scattering		
3	light through tissue, the light having at least first and second wavelength spectrums, the first		
4	and second spectrums being optimized for an oxygen saturation reading less than 80%; and		
5	calculating the oxygen saturation using coefficients suitable for the first and		
6	second optimized spectrums.		
1	42. A method for measuring blood oxygen saturation in a fetus,		
2	comprising the steps of:		
3	providing a sensor and a pulse oximeter;		
4	selecting a light source and a far red and infrared light detector;		
5	detecting light at said detector including an infrared light wavelength spectrum		
6	useful for measuring oxygen saturation in a patient with high saturation, the detected light		
7	including a far red wavelength spectrum which has a mean wavelength between 700 and 790		
8	nanometers;		
9	placing said light detectors in a single encapsulated package and mounting		
10	said package on said sensor;		
11	placing said sensor on said fetus;		
12	measuring an intensity of light from said light source at said light detectors		
13	after scattering through a portion of said fetus; and		
14	determining said blood oxygen saturation using said intensity and said pulse		
15	oximeter.		
1	43. The method of claim 42 further comprising the steps of:		
, 2	selecting said detector to detect a second red light spectrum;		
3	selecting a wavelength spectrum of said second red light spectrum to have a		
4	mean wavelength less than 700 nanometers; and		
5	selectively detecting either or both said first mentioned or second red light		
6	spectrums.		

1	44. A pulse oximeter comprising:		
2	an input connector for receiving at least first and second signals from a sensor		
3	obtained by scattering light through tissue, the light having at least first and second		
4	wavelength spectrums;		
5	a memory storing coefficients suitable for said first and second spectrums, the		
6	spectrums being optimized for an oxygen saturation reading less than 80%; and		
7	a processor, coupled to said memory and said input connector, for calculating		
8	the oxygen saturation using said coefficients.		
1	45. The pulse oximeter of claim 44 wherein said first wavelength spectrum		
2	has a mean wavelength between 700 and 790 nanometers.		
1	46. The pulse oximeter of claim 45 further comprising:		
2	a detector coupled to said connector for detecting a coding signal from a		
3	sensor indicative of a mean wavelength between 700 and 790 nanometers for said first		
4	wavelength spectrum.		
1	47 The real and a feeling 46 feether association		
1	47. The pulse oximeter of claim 46 further comprising:		
2	a decoder, coupled to said detector and said memory, for selecting appropriate		
3	coefficients from said memory based on said coding signal.		
1	48. The pulse oximeter of claim 46 wherein said detector further comprises		
2	means for passing a current through an impedance element in said sensor, said impedance		
3	element having a value indicative of a mean wavelength between 700 and 790 nanometers for		
4	said first wavelength spectrum.		
1	49. A fetal pulse oximeter comprising:		
2	an input connector for receiving at least first and second signals from a sensor		
3	obtained by scattering light through tissue of a fetus, the light having at least red and infrared		
4	spectrums;		
5	a memory storing coefficients suitable for said infrared spectrum having a		
6	range useful for measuring oxygen saturation in a patient with high saturation and said red		
7	light spectrum having a mean wavelength between 700 and 790 nanometers; and		
8	a processor, coupled to said memory and said input connector, for calculating		
9	the oxygen saturation of said fetus using said coefficients		

I		50.	The pulse eximeter of claim 49 wherein said memory further	
2	comprises:			
3		coeffic	cients for a red light spectrum having a mean wavelength less than 700	
4	nanometers.			
1		51.	A pulse oximeter, comprising:	
2		an inp	ut connector for receiving at least first and second signals from a sensor	
3	obtained by scattering light through tissue, the light having at least red and infrared			
4	spectrums;			
5		a mem	nory storing coefficients suitable for said spectrums, each of the	
6	spectrums being optimized for the products of their respective extinction and scattering			
7	coefficients in	oefficients in blood perfused tissue, the products forming first and second values, a ratio		
8	between said first and second values being between 0.5 and 2 for a majority of oxygen			
9	saturations less than 80 percent; and			
10		a proc	essor, coupled to said memory, for calculating the oxygen saturation	
11	using said coe	efficient	s.	
1		52	A multiple continuation for an arranging 1.1. A continuation of the first form	
		52.	A pulse oximeter for measuring blood oxygen saturation in a fetus,	
2	comprising:			
3		an inp	ut connector for receiving at least first and second signals from a sensor	
4	obtained by detecting light having at least red and infrared spectrums, the light being			
5	scattered from tissue;			
6	a memory storing coefficients suitable for said spectrums being optimized for			
7	reducing the sensitivity of a blood oxygen saturation measurement to perturbation induced			
8	artifact for saturations less than 65 percent; and			
9		a proc	essor, coupled to said memory, for calculating the oxygen saturation	
10	using said cod	efficient	s.	